

What is claimed is:

1. Finger operated spray pump comprising  
a liquid reservoir for containing a supply of liquid,  
an atomizer,

a cylinder having a volume therein for containing a portion of liquid from the reservoir, said cylinder being connected at one end to the atomizer for ejecting part of the liquid therein out through the atomizer,

a piston sealingly mounted within the cylinder and movable within and relative to the cylinder in a spray stroke during which the volume within the cylinder is reduced and a corresponding amount of the liquid in the cylinder is ejected through the atomizer , and in a return stroke during which the volume within the cylinder is increased and a corresponding amount of the liquid is drawn from the supply of liquid in the liquid reservoir into the cylinder,

a passageway means connecting the cylinder with the supply of liquid in the liquid reservoir,

a one way valve means at the passageway means allowing a flow of liquid only a direction from the supply of liquid into the cylinder,

a finger operated actuator which is displaceable relative to the liquid reservoir by finger pressure to produce the spray stroke, said actuator being displaceable in an opposite direction during the return stroke,

wherein the displacement of the actuator induces the movement of the piston relative to the cylinder,

wherein the piston has an outer diameter and the cylinder has a corresponding inner diameter that are between about 0.5 mm and about 4.0 mm,

wherein the atomizer has at least one nozzle, said at least one nozzle having a diameter of between 15  $\mu\text{m}$  and 150  $\mu\text{m}$ ,

wherein the piston is adapted to produce an operating pressure within the cylinder during the spray stroke of between 10 bar and 400 bar from average finger applicable forces,  
and

wherein the atomizer, the cylinder, the piston and the one way valve means are manufactured of materials and in a way to withstand an operating pressure of up to about 400 bar.

2. Finger pump according to claim 1, wherein the piston has a stroke length of between 2 and 30 mm

3. Finger pump according to claim 1, wherein the piston has a stroke length of between about 15 mm and about 20 mm.

4. Finger pump according to claim 1, wherein the piston is adapted to produce a liquid dose per spray stroke of between 5  $\mu$ l and 300  $\mu$ l.

5. Finger pump according to claim 1, wherein the piston is adapted to produce a liquid dose per spray stroke of between about 10  $\mu$ l and about 100  $\mu$ l.

6. Finger pump according to claim 1, wherein the piston is adapted to produce a liquid dose per spray stroke of between about 20  $\mu$ l and about 50  $\mu$ l.

7. Finger pump according to claim 1, wherein the piston is fixedly attached to the liquid reservoir, is hollow piston and forms the passageway means, the passageway means being directly connected at one end to the supply of liquid and being connected at another end to the cylinder.

8. Finger pump according to claim 1, wherein the piston is fixedly attached to the liquid reservoir, is hollow piston and forms the passageway means, the passageway means being connected at one end to the supply of liquid via a dip tube and being connected at another end to the cylinder.

9. Finger pump according to any one of the claims 1, wherein the piston is fixedly attached to the actuator and is hollow, and wherein the piston forms a connecting means for connecting the cylinder with the atomizer.

10. Finger pump according to claim 9, wherein the piston has an internal diameter of between about 0.2 mm and about 3.0 mm.

11. Finger pump according to claim 9, wherein the piston has an internal diameter of between about 0.5 mm and about 1.0 mm.

12. Finger pump according to claim 8, wherein the piston has an internal diameter of between about 0.2 mm and about 3.0 mm.

13. Finger pump according to claim 8, wherein the piston has an internal diameter of between about 0.5 mm and about 1.0 mm.

14. Finger pump according to claim 12, wherein the piston is a metal capillary tube.

15. Finger pump according to claim 10, wherein the piston is a metal capillary tube.

16. Finger pump according to claim 1, wherein the actuator has a body made from metal.

17. Finger pump according to claim 1, wherein said metal is aluminium

18. Finger pump according to claim 1, wherein the actuator has a body made from a highly pressure resistant plastic.

19. Finger pump according to claim 8, wherein the piston is fixedly attached to the liquid reservoir, and wherein the cylinder and the atomizer are arranged within or as part of the actuator.

20. Finger pump according to claim 9, wherein the piston is fixedly attached to the liquid reservoir, and wherein the cylinder and the atomizer are arranged within or as part of the actuator.

21. Finger pump according to claim 9, wherein the cylinder is fixedly attached to the liquid reservoir, and wherein the piston is fixedly attached to the actuator.

22. Finger pump according to claim 10, wherein the cylinder is fixedly attached to the liquid reservoir, and wherein the piston is fixedly attached to the actuator.

23. Finger pump according to claim 1, wherein a filter is provided between the cylinder and the atomizer to protect the atomizer.

24. Finger pump according to claim 1, wherein a second one way valve means is provided between the atomizer and the cylinder for preventing air ingress into the cylinder, via the atomizer, during the return stroke.

25. Finger pump according to claim 1, wherein the liquid reservoir is a rigid bottle with the passageway means fixedly connected thereto.

26. Finger pump according to claim 25, wherein the rigid liquid reservoir is provided with an air vent means to allow pressure equalization in the liquid reservoir.

27. Finger pump according to claim 1, wherein the liquid reservoir is a collapsible bag directly connected to the passageway means.

28. Finger pump according to claim 1, further comprising a fixing means for fixing the actuator on the reservoir in a lowered position, said fixing means being releasable for a first return stroke before activating the spray pump.

29. Finger pump according to claim 1, further comprising a return spring for producing said return stroke of the finger operated actuator by a return spring force.

30. Finger pump according to claim 1, wherein the outer diameter of the piston and the corresponding inner diameter of the cylinder are between 1.0 mm and about 3.0 mm.

31. Finger pump according to claim 30, wherein the outer diameter of the piston and the corresponding inner diameter of the cylinder are between about 1.5 mm and about 2.5 mm.

32. Finger pump according to claim 1, wherein the diameter of the at least one atomizer nozzle is between about 30  $\mu\text{m}$  and 100  $\mu\text{m}$ .

33. Finger pump according to claim 1, wherein the operating pressure that the piston is adapted to produce within the cylinder during the spray stroke from average finger applicable forces is between about 40 bar and about 200 bar.

34. Finger pump according to claim 1, wherein the operating pressure that the piston is adapted to produce within the cylinder during the spray stroke from average finger applicable forces is between about 50 bar and about 100 bar.

35. Finger operated spray pump comprising  
a liquid reservoir for containing a supply of liquid,  
an atomizer,  
a cylinder having a volume therein for containing a portion of liquid from the reservoir, said cylinder being connected at one end to the atomizer for ejecting part of the liquid therein out through the atomizer,

a piston sealingly mounted within the cylinder and movable within and relative to the cylinder in a spray stroke during which the volume within the cylinder is reduced and a corresponding amount of the liquid in the cylinder is ejected through the atomizer, and in a return stroke during which the volume within the cylinder is increased and a corresponding amount of the liquid is drawn from the supply of liquid in the liquid reservoir into the cylinder,

a passageway means connecting the cylinder with the supply of liquid in the liquid reservoir,

a one way valve means at the passageway means allowing a flow of liquid only a direction from the supply of liquid into the cylinder,

a finger operated actuator which is displaceable relative to the liquid reservoir by finger pressure to produce the spray stroke, said actuator being displaceable in an opposite direction during the return stroke,

wherein the displacement of the actuator induces the movement of the piston relative to the cylinder,

wherein the piston has an outer diameter and the cylinder has a corresponding inner diameter that are between about 1.5 mm and about 2.5 mm,

wherein the atomizer has at least one nozzle, said at least one nozzle having a diameter of between 30  $\mu\text{m}$  and 100  $\mu\text{m}$ ,

wherein the piston is adapted to produce an operating pressure within the cylinder during the spray stroke of between 50 bar and 100 bar from average finger applicable forces, and

wherein the atomizer, the cylinder, the piston and the one way valve means are manufactured of materials and in a way to withstand an operating pressure of up to at least about 100 bar.

36. Finger pump according to claim 35, wherein the piston has a stroke length of between about 15 mm and about 20 mm.

37. Finger pump according to claim 35, wherein the piston is adapted to produce a liquid dose per spray stroke of between about 20  $\mu\text{l}$  and about 50  $\mu\text{l}$ .

38. Finger pump according to claim 35, wherein the piston is fixedly attached to the liquid reservoir and is a hollow piston which forms the passageway means, the passageway means being directly connected at one end to the supply of liquid and being connected at another end to the cylinder.

39. Finger pump according to claim 35, wherein the piston is fixedly attached to the liquid reservoir, is hollow piston and forms the passageway means, the passageway means being connected at one end to the supply of liquid via a dip tube and being connected at another end to the cylinder.

40. Finger pump according to claim 35, wherein the piston is fixedly attached to the actuator and is hollow, and wherein the piston forms a connecting means for connecting the cylinder with the atomizer.

41. Finger pump according to claim 40, wherein the piston has an internal diameter of between about 0.2 mm and about 3.0 mm.

42. Finger pump according to claim 40, wherein the piston has an internal diameter of between about 0.5 mm and about 1.0 mm.

43. Finger pump according to claim 39, wherein the piston has an internal diameter of between about 0.2 mm and about 3.0 mm.

44. Finger pump according to claim 39, wherein the piston has an internal diameter of between about 0.5 mm and about 1.0 mm.